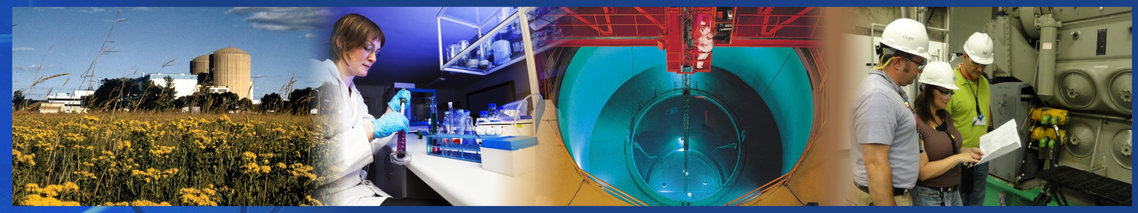
U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

RIC 2015



Fire Research: Answering the Burning Questions

Fire Modeling

NUREG-1824, Supplement 1, "Verification and Validation of Selected Fire Models for Nuclear Power Plant Applications"
In conjunction with the National Institute of Standards and Technology (NIST) and the Electric Power Research Institute (EPRI), a supplement to NUREG-1824 concerning the verification and validation of fire models that have been updated since publication of NUREG-1824 has been issued for public comment.

NUREG-2164, "Consolidation of the 1985 Sandia National Laboratory/Factory Mutual Main Control Room and Electrical Cabinet Fire Test Data"
Data from older experimental programs on electrical cabinet fires were updated to conform to current computational standards.

Fire Testing

Determining the Effectiveness, Limitations, and Operator Response for Very Early Warning Fire Detection (VEWFD) Systems in Nuclear Facilities (DELORES-VEWFIRE)
The NRC Office of Nuclear Regulatory Research (RES) is preparing to publish this report for public comment. It details the testing of very early warning fire detection systems and conventional spot-type smoke detectors for their ability to detect incipient electrical fires.

Heat Release Rates of Electrical Enclosure Fires (HELEN-FIRE)
In a joint testing program with NIST, RES conducted over 100 experiments in electrical enclosures to better characterize their properties under fire conditions.

International Fire Research

Organization for Economic Cooperation and Development (OECD) Program on High-Energy Arc Faults (HEAF) Fire Experiments, Joint Analysis of Arc Faults (JOAN of ARC)
In partnership with OECD, RES has conducted three rounds of testing on high-energy arc faults with the goal of quantifying damage caused by an initial electrical arc and secondary fires. This project aims at improving the state of knowledge regarding HEAF events for better characterization in probabilistic risk assessment (PRA).

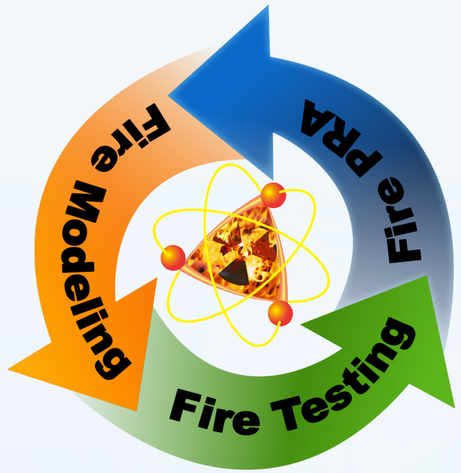
OECD Fire Incident Records Exchange (FIRE) Project and Database
RES is also partnering with OECD in the development of a framework for multinational cooperation in sharing event information useful to fire risk assessment. It details the testing of very early warning fire detection systems and conventional spot-type.

Fire Research Collaboration with Japanese Regulatory Authorities
Under the terms of a memorandum of understanding (MOU), the NRC and Japan's Nuclear Regulation Authority (NRA—formerly JNES), have agreed to share the results of fire research related to fire PRA, fire modeling, and laboratory fire testing.

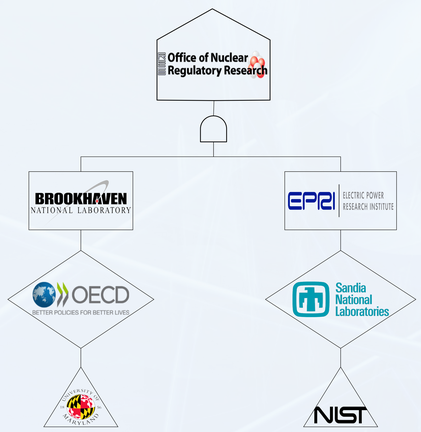
Training

Methods for Applying Risk Analysis to Fire Scenarios (MARIA-FIRES)
RES is updating the 2008 and 2010 Fire PRA Workshop self-study training tool to reflect the newest material presented in 2012.

Fire PRA Workshop
As a collaborative effort, RES and EPRI will continue to provide free public training sessions on fire PRA in 2015. The training will consist of five separate classes: Fire PRA, Circuit Analysis, Fire Analysis, Fire HRA, and Advance Fire Modeling.



Collaborative External Partners



Fire Probabilistic Risk Assessment (PRA) and Human Reliability Analysis

Level 3 PRA
Fire Research Branch (FRB) staff is supporting RES's Level 3 PRA project in the areas of dry-cask storage and fire PRA.

NUREG-2169, "Nuclear Power Plant Fire Ignition Frequency and Non-Suppression Probability Estimation Using the Updated Fire Events Database"
Using input from the updated EPRI Fire Events Database, RES has updated fire event frequency estimates for use in PRA applications.

Refining and Characterizing Heat Release Rates from Electrical Enclosures During Fire (RACHELE-FIRE)
The Electrical Enclosure Heat Release Rate (HRR) Working Group is a joint effort between RES and EPRI to re-evaluate electrical enclosure HRRs documented in NUREG/CR-6850.

Response Bias of Electrical Cable Coatings at Fire Conditions (REBECCA-FIRE)
In collaboration with Sandia National Laboratories, this effort was undertaken to quantify the additional protection provided by fire retardant cable coating and delay in cable damage for PRA applications.

Fire PRA Guidance for Main Control Room (MCR) Abandonment Scenarios
RES, in cooperation with EPRI, will expand guidance for addressing fire PRA scenarios that involve MCR abandonment due to loss of control room habitability and loss of plant control.

Fire and Electrical Systems Circuit Analysis

NUREG/CR-7150 (BNL-NUREG-98204-2012) "Joint Assessment of Cable Damage and Quantification of Effects from Fire" (JACQUE-FIRE)
In an ongoing partnership with EPRI and Brookhaven National Laboratories (BNL), RES continues to develop the JACQUE-FIRE series publications. The second volume was published in May 2014 and provides expert elicitation on the conditional likelihood and duration of spurious operation of equipment in nuclear facilities given fire damage. Phase three involved using a working group to provide additional guidance for deterministic and performance-based circuit analysis.

Non-Reactor Research

NUREG/CR-7168, "Regulatory Approaches for Addressing Reprocessing Facility Risks; An Assessment"
This report documents various countries' approaches to risk management in fuel reprocessing facilities. It also includes perspectives on accidents that have occurred in such facilities, both domestically and internationally.

NUREG/CR-7115, "Performance of Metal and Polymeric O-Ring Seals in Beyond-Design-Basis Temperature Excursions"
Small-scale thermal tests were conducted to provide experimental data on the performance of metallic and polymeric O-ring seals in configurations typically used for spent nuclear fuel storage. The results of phase 1, which focused on single metallic O-ring seals, has been published. Phase 2 testing is focused on single polymeric O-ring seals and double O-ring configurations.

Other Research Activities

NUREG/CR-7135, "Compensatory and Alternative Regulatory Measures for Nuclear Power Plant FIRE Protection" (CARMEN-FIRE)
With support from BNL, a draft report for public comment was issued in June. The report contains guidance for evaluating the acceptability of interim compensatory measures for degraded fire protection features at nuclear power plants.